Iraqi Journal of Veterinary Sciences

www.vetmedmosul.com

The effect of using effective micro-organisms on the histopathological, immunohistochemical expression of kidneys in quails under thermal stress

H.B. Al-Sabaawy[1], R.K. Ali[2], B.J. Saadoon[3] and M.M. Younes[4]

[1]Department of Pathology and Poultry Diseases, Collage of Veterinary Medicine, University of Mosul, Mosul, [2]Department of Pathology and Poultry Diseases, Collage of Veterinary Medicine, University of Fallujah, Fallujah, [3]College of Medical and Health Technologies, Al-Zahraa University for Women, Karbala, [4]Agriculture Directorate, Anbar, Iraq

Article information

Article history:
Received 18 April, 2025
Accepted 09 September, 2025
Published 10 November, 2025

Keywords:
Quails
IL1ß
Effective Microorganism
Thermal stress

Correspondence:
H.B. Al-Sabaawy
hadeelbasim2006@gmail.com

Abstract

Heat stress in chicken husbandry is substantial stressor factor with increasing environmental temperature its prominence will increasing. To investigate the renal tissue histopathological finding and immunohistochemical expression of interleukin-1beta (IL-1B) in the renal tissue of quails exposed to stress factor and supplemented with effective microorganism (EM). Forty one-day -old quails were utilized which were assign randomly into 4 groups of 10 quails every in each: M1 (control groups), M2 exposed to heat stress (36 C for sixty hour), M3 were giving both (EM and exposed to stress) and M4 remedy with Effective Microorganism (EM) 1000ppm in drinking water, 5 birds from each group were sacrificed at the end of experiment (20 and 40days respectively), the kidney was weighed, then 4-5nµ sections were prepared, stained with hematoxylin and eosin. Immunohistochemistry procedures were applied according to manufacturer's protocol. Microscopic finding was identified by infiltration of inflammatory cell, bleeding, glomerular atrophy, and glomerular necrosis, sever destruction of tubular epithelium, coagulate necrosis, pyknosis and hyper cellularity, kidney relative weights was higher in Effective Microorganism group than controls and others groups, IL-1B cytokine protein expression was higher at 40 days of the experiment in contrast to first 20 days of it. From this result were concluded that although quails are resistant to environmental conditions, thermal stress had a negative impact on the study parameters.

DOI: 10.33899/ijvs.2025.159271.4234,

Introduction

One of the environmental factors that affects the poultry industry all over the world is heat stress (1). Poultry is very sensitive to thermal stress and their capacity to dissipate the heat of the body is low (2). Thermal stress decreases weight of egg and quality of shell in laying hens (3). Furthermore, laying hens exposure to high temperature causes a reduction in level of phosphorus and plasma calcium (4-6) which are essential minerals for hens that affect production of egg and quality of shell (7-9). The renal tissue plays an important role in preserve phosphorus and calcium homeostasis which is equiponderant by renal excretion and absorption of gastrointestinal tract. Effective microorganism (EM) is a mixed cutler cell which is consist of yeast, fungi, photosynthetic bacteria and actinomycetes (10,11). EM is considered a new technology were contrived in Japan. It's a combination of 65-75 types of perfect microorganism contributing to a wide ambit of applications. EM microorganism is not engineered genetically, but they are usually found in food and healthy soils forest. EM mutually live together to form useful relationships with each other in a runny medium (12). EM microorganism helps one other for survival in a chain of food and whereby form synergy that struggle the rotting and pathogens. Effective microorganisms are sterilizing (PH between 3. 3-3. 6), thus pathogenesis cannot survive inside its. Chronic thermal stress accountable for poor growth of body weight and gain rate and week animal body immune system (13,14) Moreover in different stress state, pro-inflammatory and anti-inflammatory cytokine excrete from various immune cell and play important role to limited the immune condition of an organism (15,16) mostly, pro-inflammatory cytokines intercede inflammatory damage, while anti-inflammatory cytokines improve inflammation and spur healing process (17). during inflammatory response, several interleukin and cytokine such as IL-1B, IL-1, 2, 6 are involved on increasing immune response exacerbation. IL-1B and IL-6 is a main inducer of acute inflammatory response.

The aim of this study was to evaluate the effects of heat stress and effective microorganisms on kidney weight, renal tissue pictures and interleukin expression.

Materials and methods

Ethical approval

The study was operated in the pathology and poultry diseases departments, Veterinary Medicine College, Mosul University, Mosul, Iraq. The prior ethics from the Ethical Committee of Mosul University at (1-10-2023), (UM. VET. 2033. 033).

Empirical design

Forty one-day old quails were used, after adaption period they partitioned as follow, M1 (control groups), M2 exposed to heat stress (36°Cfor sixty hour), M3 were giving both (EM and exposed to stress) and M4 remedy with Effective Microorganisms with 1000ppm in drinking water (1gm/L) according to (18), and throughout the experiment period all birds received the same food ration, Birds were sacrificed at 20 and 40 days of the experiment respectively.

Relative weight of the kidney

Kidney tissue was collected from quails after performing an microscopical description of it, and the relative weight of it was calculated based on the following equation: Relative weight of the organ = (weight of the organ/weight of the living body)*100.

Histopathology findings

Animals were sacrificed at 20 and 40 days of the experiment, respectively. After the kidney was weighed, a part of it was cut and fixed in formalin solution%10, embedded in blocks of paraffin sliced at 4-5µm, mounted and stained with routine stain. The stained slides were prepared for the histopathology examination (19).

Immunohistochemistry

The kidney samples were pre-fixed overnight and processed using an automated tissue processor. The embedding station was used to embed the paraffin-treated kidney samples. Using a rotary microtome, kidney slices were cut to 3-4 µm thick and the sections were fixed on hard-frozen slides. To remove paraffin, distilled water was used with ethanol and xylazine in graded concentrations. section was heated using citrate buffer to restore antigen efficiency using a microwave for five minutes. The detection kit of the HRP/DAB type (Abcam) was used, and the pro-inflammatory cytokines (IL-1B) was used at 1:500dilution, with primary antibody the segment were incubated, follow by horseradish peroxidase conjugate were incubated and substrate with DAB eventually the segment were kowtow to counterstaining with Hematoxylin for examination under the light microscope and photographed by camera, the intensity color of immunohistochemistry was graded from 1-4 scale in which 1 no staining color and 4 high intensity color (19).

Statistical analysis

A student's t- test the data analyzed, at mean ±SE. the significant level was at probability level $P<0.05$ (20).

Results

Relative weight of the kidney

The kidney relative weight statistical analysis result showed a significant increase at the probability level $P<0.05$ in the group treated with EM 3.00%, and a significant decrease was observed in the group exposed to heat stress 1.52% compared to the first and the fourth groups at 20 days of the experiment. Additionally, the third group recorded a significant increase in the relative weight of the kidney at the 40 days of the experiment 1.62% than other. A significant decrease in the relative weight was observed in the second group 1.33% at the 40 days of the experiment (Figure 1).

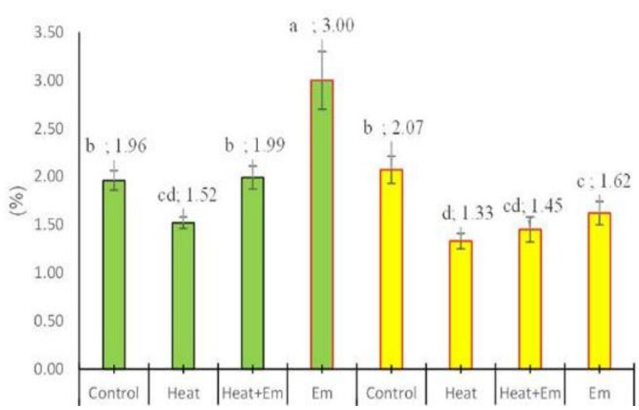

Figure 1: Kidney relative weight between 20 and 40 days of the experiment.

Histopathology finding

The result showed that, the general histological characteristics of the kidney in the M1 was normal, in second group the renal tissue section showed bleeding, atrophy, glomerular tissue necrosis in addition to sever destruction in the tubular epithelium at middle and the end of the experiment (Figures 2 and 3). Area of bleeding with infiltration of inflammatory cells, coagulative necrosis and atrophy of glomerular tubules are showed in M3 groups (Figures 4 and 5), as well as the effective microorganism treated group showed Pyknosis and hyper cellularity (Figures 6 and 7). Table 1 showed renal tissue lesions, categories, grade of lesions and figure number.

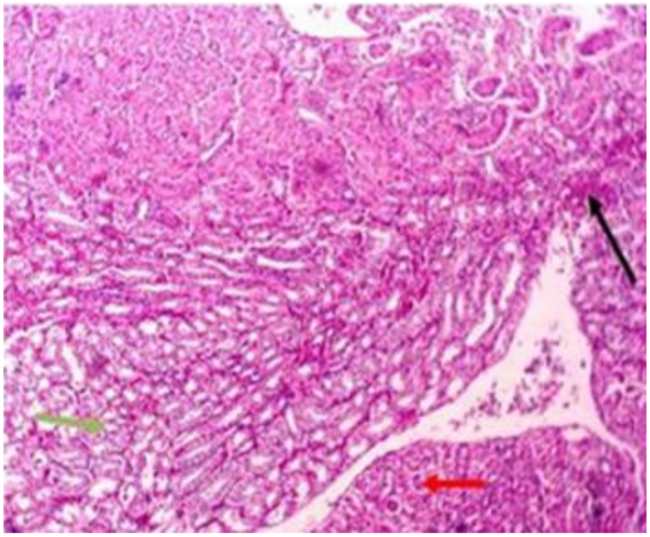

Figure 2: Kidney micrograph section showed Presence of glomerular tuft atrophy (red arrow) and glomerular tissue bleeding (black arrow), tubular cells necrosis (green arrow), 20 days of the experiment, M2 groups, X100.

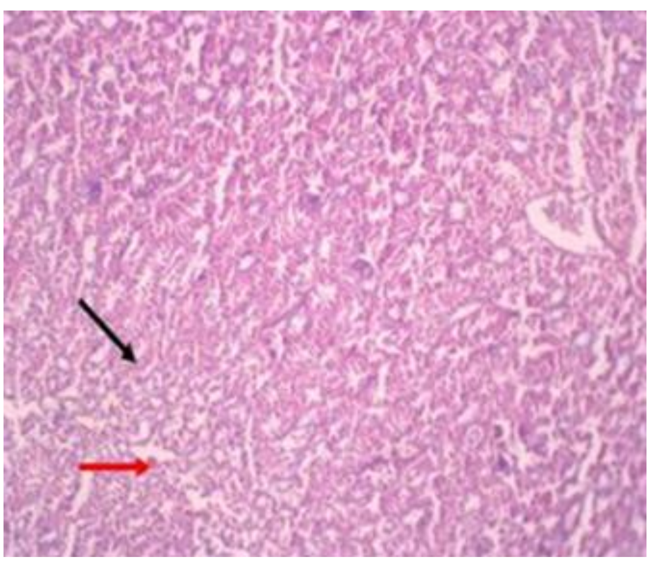

Figure 3: Kidney micrograph section showed sever destruction of tubular epithelium (black arrow) and bleeding (red arrow), 40 days of the experiment, M2 groups, X100.

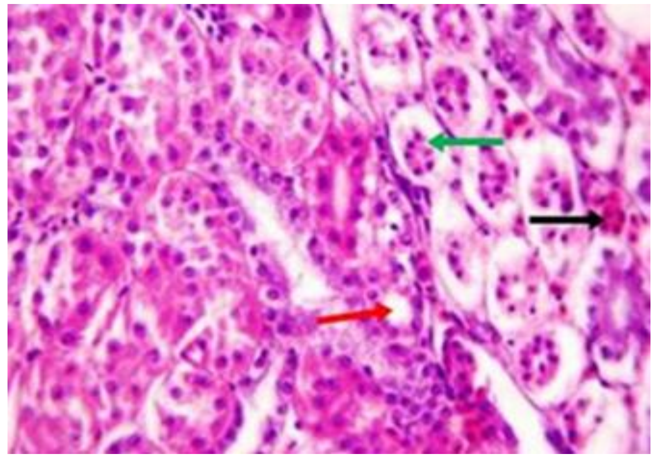

Figure 4: Kidney micrograph section showed Presence of bleeding (black arrow) coagulate necrosis (green arrow) and atrophy of glomerular tubules (red arrow), 40 days of the experiment, M3 groups, X100.

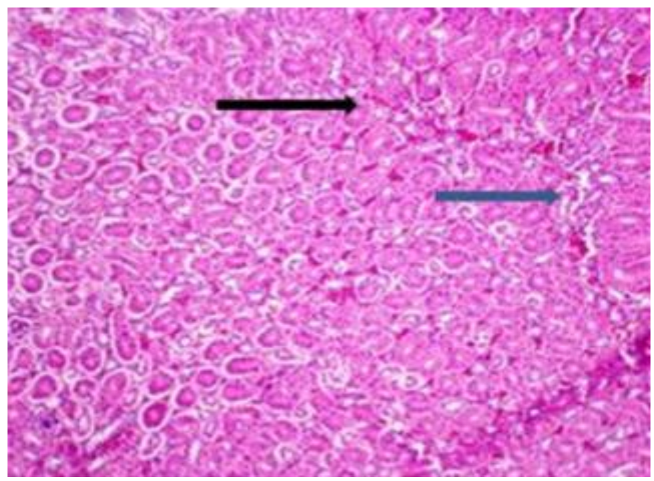

Figure 5: Kidney micrograph section showed Presence of bleeding (blue arrow), infiltration of inflammatory cell (black arrow), 40 days of the experiment, M3 groups, X100.

Table 1: Kidney microscopic lesions description

Lesion Description	Grade	Figure	Groups
Circulatory and growth disturbances, necrosis	severe	2 and 3	M2 (Heat)
Circulatory disturbance, necrosis, infiltration of inflammatory cell	Severe and mild	4 and 5	M3 (Mixing)
Pyknosis, hyper cellularity, infiltration of inflammatory cell	Moderate and mild	6 and 7	M4 (EM)

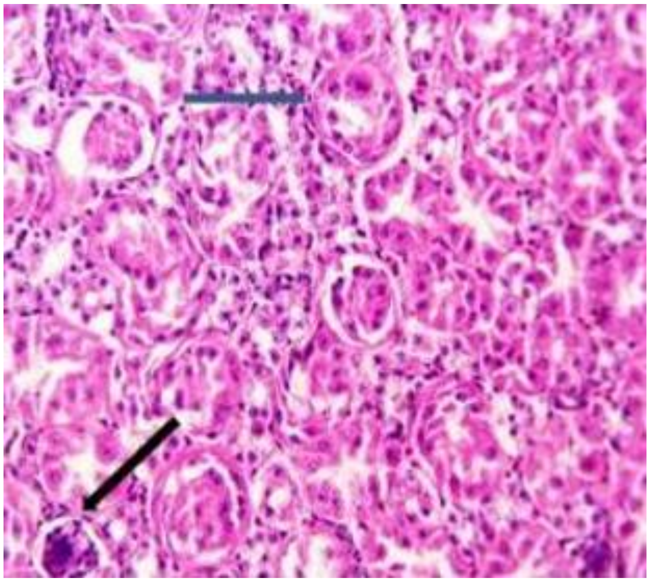

Figure 6: Kidney micrograph section showed Presence of pyknosis (green arrow) and hyper cellularity (black arrow), 20 days of the experiment, M4 groups, X400.

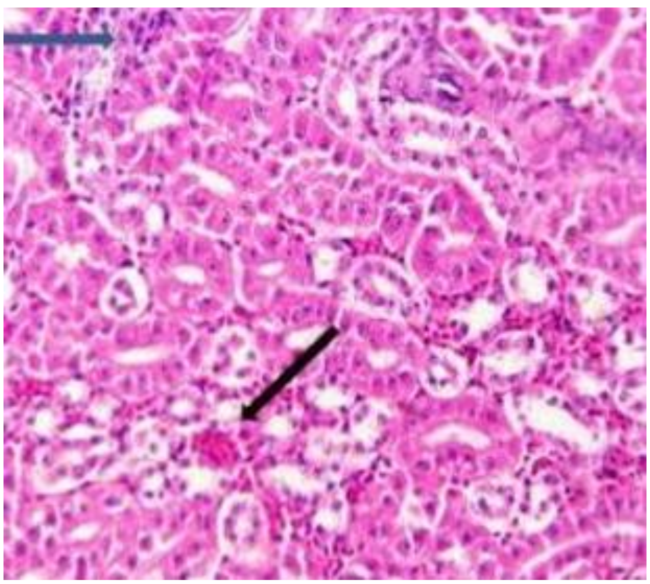

Figure 7: Kidney micrograph section showed Presence of bleeding) black arrow), infiltration of inflammatory cell (blue arrow), 40 days of the experiment, M4 groups, X400.

Immunohistochemistry finding

The immunohistochemistry result showed that IL-1B expression was positively stained with moderates and sever grade inside glomerular and cytoplasm of the tubular lining cells in the all treated groups (Figures 8-13).

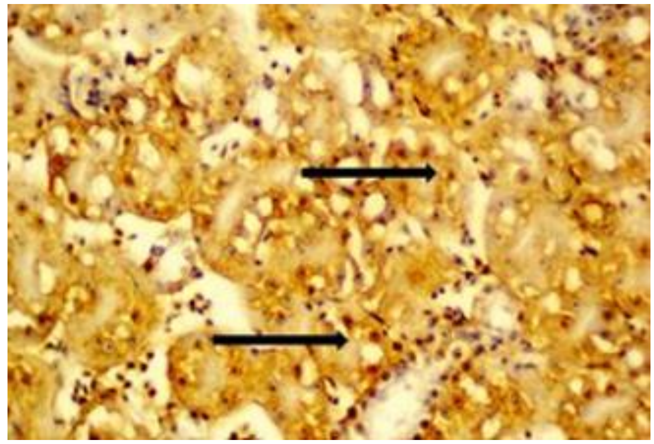

Figure 8: Tubular and glomerular expression (moderates) of IL-1B in quail's kidney, M2, 20 days of the experiment, 400X.

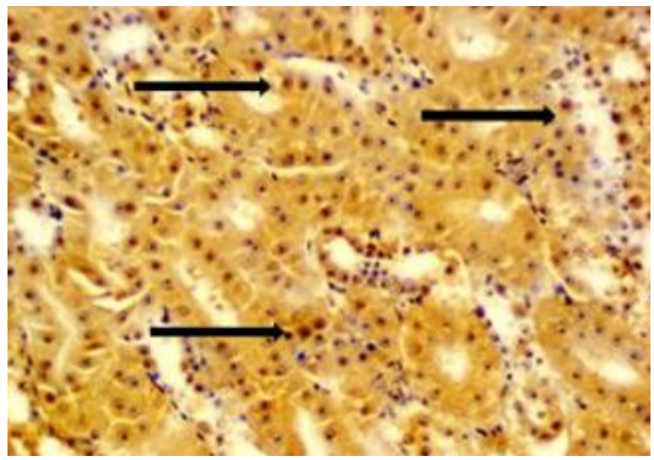

Figure 9: Tubular and glomerular expression (sever) of IL-1B in quail's kidney, M2, 40 days of the experiment, 400X.

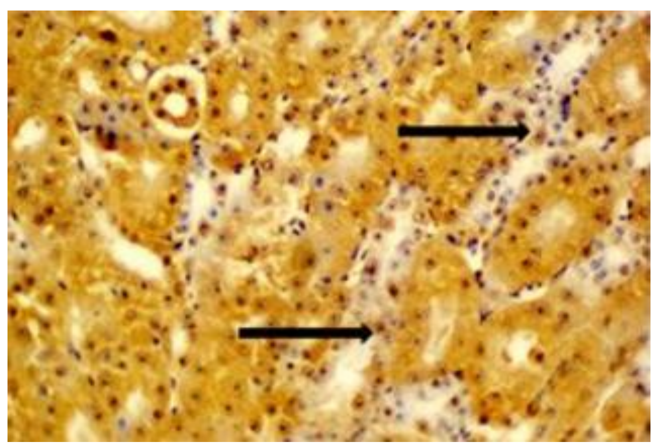

Figure 10: Tubular and glomerular expression (moderates) of IL-1B in quail's kidney, M3, 20 days of the experiment, 400X.

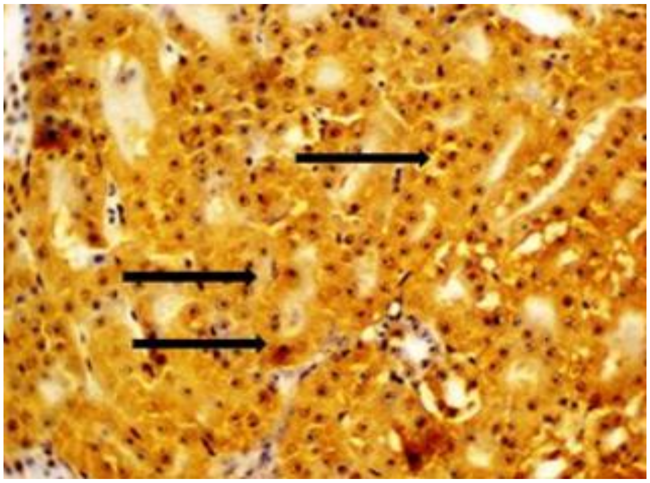

Figure 11: Tubular and glomerular sever expression of IL-1B in quail's kidney, M3, 40 days of the experiment, 400X.

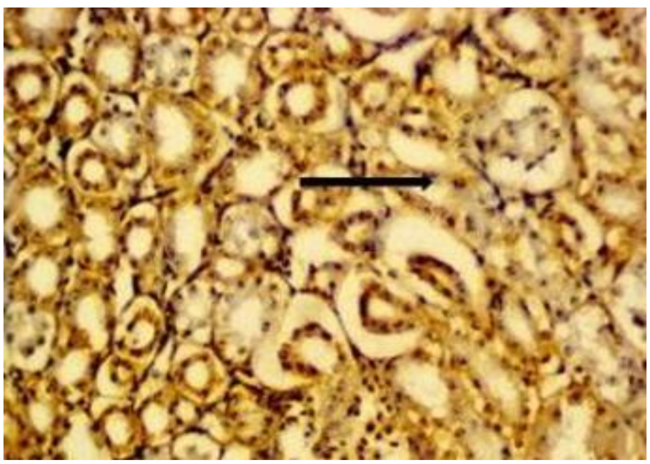

Figure 12: Tubular and glomerular (moderates) expression of IL-1B in quail, s kidney, M4, 20 days of the experiment, 400X.

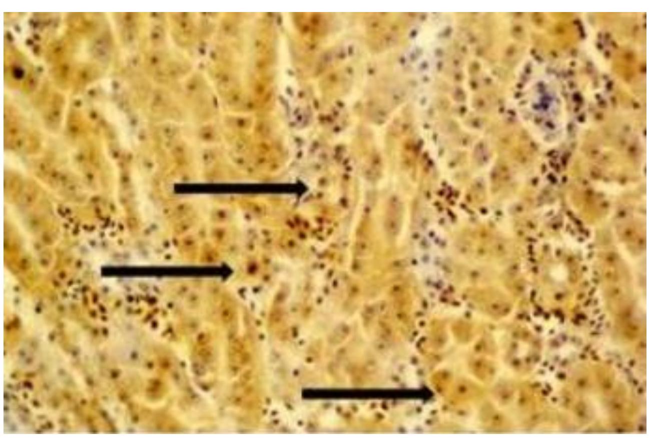

Figure 13: Tubular and glomerular expression (sever) of IL-1B in quail's kidney, M4, 40 days of the experiment, 400X.

Discussion

The current study aimed to discuss the incidental renal tissue Histopathological pictures and the effects of EM in quails exposed to thermal stress. A significant increase in the renal tissue weight in EM groups, A non-significant increase in the renal tissue weight was observed in the thermal stress and mixing groups, these ascribes to kidney role in participates in many vital activities of the body and exposure to stress factors (such as heat, transportation, overcrowding) affects the metabolic processes of the kidney (21,22) and decreased blood flow and decreased levels of calcium and phosphorus in the plasma, as the kidney requires a large amount of energy in order to perform its functions (23). Effective microorganism reduces kidney damage and weight loss as these organisms increase blood flow to the kidney and its production of protein-forming enzymes in the digestive system and the absorption of these enzymes attributed to increase in protein and amino acids decomposition by liver during the urea cycle, which leads to an increase in blood urea levels resulting within normal limits. The increase in protein is followed by an increase in Creatinine levels due to the digestion of protein and the production of many essential amino acids (24). The increase in urea and Creatinine within the normal range shows a positive effect because it indicates an increase in the digestion process and protein formation to support the growth process and increase kidney weight (25). Heat stress causes pathological changes in the kidney tissue, represented by degeneration, necrosis, due to oxidative stress resulting from the lack of oxygen and nutrient supplies return to lack of blood supply to the kidney (26,27), which causes damage to the mitochondria and affects oxidative phosphorylation and leads to rapid depletion of adenosine triphosphate (ATP) and failure of enzymes and energy-dependent ions, especially Na^+, K^+, ATPase, with which leads to an imbalance in the concentration of Na^+, K^+, and electrolytes ions inside and outside the cell, and it is no longer possible to provide better electronics to maintain kidney functions. infiltration of inflammatory cells, and congestion were also detected in the renal tissue due to hypoxia (28). The result showed that EM caused histological changes in the renal tissue represented by necrosis, congestion of blood vessels with infiltration of inflammatory cells. This is attributed to the fact that effective organisms contain bacteria and yeasts, and giving of these organisms for a long period led to fermentation and decomposition of all easily fermentable starches and carbohydrates, causing an increasing breakdown of protein into amino acids (29,30) and an increase in the formation of glutathione, which is the main metabolic source for the formation of ammonia.

IL-1B is a group of cytokines, proteins and gene. There are two types of them IL-1 B and α. It produced by mononuclear cells, macrophages, and lymphocytes (31,32). Heat stress causes an imbalance between oxidation and antioxidants due to the production of many reactive oxygen species, production of free radicals, the formation of lipid peroxide, oxidative damage to membranes and activation of cellular immunity. Histological examination of kidney tissue in quails showed positive expression (moderate and severe degree) during the first and second killings, and it was highest in the second killings. It's correlated with the impact of heat as a stress factor and its effect on the blood supply of the digestive system, the construction of blood vessels, occurrence of hypoxia, decrease of nutrients and increase oxidative stress by free radicals (RNS and ROS) that leads to the weakness of the intestinal barrier resistance to stress factors, parasitic and bacterial infections and the occurrence of inflammation represented by many responses to pro-inflammatory cytokines. Alternative antibiotic like probiotics, antioxidants and effective microorganisms have beneficial effect on poultry production through improving intestinal balance and stimulating the immune response (33). IL-1B intensity expression moderate to severe, this is attributed to the expression balance between pro- and anti-inflammatory cytokines, regulating the physiological response for the body's immune function (34), and maintaining a stable balance between the effectiveness of additives, alternative antibiotics and the ability to suppress and invade pathogens (35-37).

Conclusion

Quail Renal Tissue showed a series of Histopathological lesions that characterized by 7 types of lesions, a majority of specimen having bleeding, infiltration of inflammatory cells and necrosis, although quails are resistant to environmental conditions, heat stress had a negative effect on kidney tissue and IHC found moderate to severe immune reactivity of IL-1B specially after 40 days of the experiment. We propose to investigation the molecular pathways of such material and find the notch genes responsible of such improvements and repair of tissue damage resulting from any type of microbiological infections

Acknowledgment

The researchers thank the College of Veterinary Medicine, University of Mosul for providing all the easiness to complete the research paper.

Conflict of interest

There is no conflict of interest

References

1. Wasti S, Sah N, Mishra B. Impact of heat stress on poultry health and performances, and potential mitigation strategies. Animals. 2020;10:1266. DOI: 10.3390/ani10081266
2. Apalowo OO, Ekunseitan DA, Fasina YO. Impact of Heat Stress on Broiler Chicken Production. Poult. 2024;3(2):107–28. DOI: 10.3390/poultry3020010
3. Furuta K. On the Relation between Ambient Temperature and the Performance of Laying Hen. Jap Poult Sci. 1966;3(3):146–50. DOI: 10.2141/jpsa.3.146
4. Allahverdi A, Feizi A, Takhtfooladi HA, Nikpiran H. Effects of heat stress on acid-base imbalance, plasma calcium concentration, egg production and egg quality in commercial layers. Global Vet. 2013;10(2):203-7. DOI: 10.5829/idosi.gv.2013.10.2.7286
5. Chen S, Yong Y, Ju X. Effect of heat stress on growth and production performance of livestock and poultry: Mechanism to prevention. J Therm Biol. 2021;99:103019. DOI: 10.1016/j.jtherbio.2021.103019
6. Huang SC, Fu YF, Lan YF, Rehman MU, Tong ZX. Histopathological and biochemical evaluations of the kidney in broiler chickens under acute heat stress conditions. Indian J Anim Res. 2017;25(4):637-639. DOI: 10.18805/ijar.v0iof.7652
7. Scott TA, Balnave D. Comparison between concentrated complete diets and self-selection for feeding sexually-maturing pullets at hot and cold temperatures. Br Poult Sci. 1988;29(3):613–26. DOI: 10.1080/00071668808417088
8. Kim CH, Paik IK, Kil DY. Effects of Increasing Supplementation of Magnesium in Diets on Productive Performance and Eggshell Quality of Aged Laying Hens. Biol Trace Elem Res. 2012;151(1):38–42. DOI: 10.1007/s12011-012-9537-z
9. Hazaa IK, Ibrahim, ZY, Khalil NK, Hasan MS, Owain MS. The effect of olive leafs and seed water extract for different levels on body performance of Japanese quails. Plant Arch. 2019;19(1):1071-1074.DOI: 10.5194/aab-47-93-2004
10. Kareem MH, Ali RK, Faleh IB, Hasan MS. A Review on Sarcoidin Donkey. Int J Pharm Res. 2020;12(1). DOI: 10.3382/ps/pey087
11. Shen D. Beneficial Microorganisms and Metabolites Derived from Agriculture Wastes in Improving Plant Health and Protection. In: Xu HL, Umemura H, Parr Jr JF, editors. Nature Farming and Microbial Applications. USA: CRC Press; 2024. 349–366 p. DOI: 10.1201/9781003578239-31
12. Olle M, Williams I. The Influence of Effective Microorganisms on the Growth and Nitrate Content of Vegetable Transplants. J Adv Agric Technol. 2015;2(1). DOI: 10.12720/joaat.2.1.25-28
13. Jwher DT, Ezzulddin TA. Beneficial Microorganisms in Animal Production and environment. J Appl Vet Sci. 2022;7(3):64-71. DOI: 10.21608/javs.2022.137968.1147
14. Jin Y, Hu Y, Han D, Wang M. Chronic heat stress weakened the innate immunity and increased the virulence of highly pathogenic avian influenza virus H5N1 in mice. J Biomed Biotechnol. 2011:367846. DOI: 10.1155/2011/367846
15. Lu Q, Wen J, Zhang H. Effect of chronic heat exposure on fat deposition and meat quality in two genetic types of chicken. Poult Sci. 2007;86:1059–1064. DOI: 10.1093/ps/86.6.1059
16. Bamias G, Arseneau KO, Cominelli F. Cytokines and mucosal immunity. Curr Opin Gastroenterol. 2014;30:547–552. DOI: 10.1097/mog.0000000000000118
17. Dinarello CA. Proinflammatory cytokines. Chest. 2000;118:503–508. DOI: 10.1378/chest.118.2.503
18. Verveha BM, Gutyj BV, Holubiev MI, Kondro MM, Dats IV. Gut microbiota and changes in cytokine profile in animals with experimental acute disseminated peritonitis on the background of diabetes. Regul Mech Biosys. 2023;14(3):506–10. DOI: 10.15421/10.15421/022372
19. Kalim MS, Ahmed A, Awan WS, Sarfraz S. Diagnostic Accuracy of Combining Sonoelastography with Mammography in Solid Breast Lesions Keeping Histopathology as Gold Standard. BioMedica. 2022;30;38(1):10–7. DOI: 10.51441/biomedica/5-593
20. Tala'a AA, Ali RK, Mohammed LD, Mohammed RA. Histological Features of Different Organs before and After Treatment of Diabetes by Using Avocado Extract in Rats. Int J Anat Res. 2023;11(2):8594-99. DOI: 10.16965/ijar.2023.101

21. Chambers JM, Freeny AE, Heiberger RM. Analysis of Variance; Designed Experiments. In: Hastie TJ, editor. Statistical Models in S. USA: Routledge; 2017. 145–93 p. DOI: 10.1201/9780203738535-5
22. Ali RK, Mahdi ZS, Nawfal AJ. Protective Role of Vitamin B1 in Mitigating Liver and Kidney Damage Induced by Lead Acetate in Rabbits. J Bras Pathol Med Lab. 2025;61(1):47-55. DOI: 10.1111/vde.12434
23. Xin IK, Plumeriastuti H, Anwar C, Rachmawati K, Utama S, Legowo D. Histopathological changes of kidney of broiler chicken exposed to chronic heat stress. J Basic Med Vet. 2020;8(2):92. DOI: 10.20473/.v8i2.20411
24. Yalçın S, Yalçın S, Uzunoğlu K, Duyum HM, Eltan Ö. Effects of dietary yeast autolysate (*Saccharomyces cerevisiae*) and black cumin seed (*Nigella sativa* L.) on performance, egg traits, some blood characteristics and antibody production of laying hens. Livest Sci. 2012;145(1–3):13–20. DOI: 10.1016/j.livsci.2011.12.013
25. Salah M, Saleh EN. Experimental Study of Prepared Killed Vaccine for *S. aureus* in Local Rabbits. Med Legal Update. 2020;20(3):1127. DOI: 10.37506/mlu.v20i3.155
26. Hussein M, Ibrahim Z, Ali R. Treatment of Experimental Candidiasis in Broilers with Griseofulvin. Egypt J Vet Sci. 2024;55(5):1365–70. DOI: 10.21608/ejvs.2024.259232.175
27. Adriani L, Latipudin D, Balia Roostita L, Widjastuti T. Improvement of Small Intestine Morphometry in Broiler Chicken Using Fermented Cow and Soymilk as Probiotic. Int J Poult Sci. 2019;18(6):255–9. DOI: 10.3923/ijps.2019.255.259
28. Manalu SW, Handharyani EC. Histopathology of liver and kidney on broiler chicken exposed to heat stress and fed extract of Jaloh (*Salix tetrasperma* Roxb). Jurnal Ilmu Ternak Vet. 2012;12(1):68–73. DOI: 10.14334/jitv.v12i1.566
29. Bjerrum L, Engberg RM, Leser TD, Jensen BB, Finster K, Pedersen K. Microbial community composition of the ileum and cecum of broiler chickens as revealed by molecular and culture-based techniques. Poult Sci. 2006;85(7):1151–64. DOI: 10.1093/ps/85.7.1151
30. Kogut MH. The effect of microbiome modulation on the intestinal health of poultry. Anim Feed Sci Technol. 2019;250:32–40. DOI: 10.1016/j.anifeedsci.2018.10.008
31. Yu Y, Li Q, Zeng X, Xu Y, Jin K, Liu J. Effects of Probiotics on the Growth Performance, Antioxidant Functions, Immune Responses, and Caecal Microbiota of Broilers Challenged by Lipopolysaccharide. Front Vet Sci. 2022;21(9). DOI: 10.3389/fvets.2022.846649
32. Zmrhal V, Svoradova A, Venusova E, Slama P. The Influence of Heat Stress on Chicken Immune System and Mitigation of Negative Impacts by Baicalin and Baicalein. Animals. 2023;13(16). DOI: 10.3390/ani13162564
33. Ali RK, Falih IB. Hematological and Molecular Study of *Trypanosoma evansi* in Experimentally Infection in Rabbits. Iraqi J Agric Sci. 2024;55(3):1233-1238. DOI: 10.36103/2621tx81
34. Hatab MH, Elsayed MA, Ibrahim NS. Effect of some biological supplementation on productive performance, physiological and immunological response of layer chicks. J Radiat Res Appl Sci. 2016;9(2):185–92. DOI: 10.1016/j.jrras.2015.12.008
35. Situmeang J, Adriani L, Saefulhadjar D, Ishmayana S. Protease and Lipase Enzyme Activity of Probiotic Yogurt and its Effect on Protein, Lipid, and Cholesterol Level of Chicken Egg Yolk. Adv Anim Vet Sci. 2024;12(5). DOI: 10.17582/journal.aavs/2024/12.5.873.878
36. Ibrahim ZY, Hameed NA, Jarad AS. Prevention of Avian Crop Candidiasis by dietary Supplementation of *Saccharomyces cerevisiae*. Rev Electron Vet. 2022;23(3):435-444. [available at]
37. Zhang L, Zhang R, Jia H, Zhu Z, Li H, Ma Y. Supplementation of probiotics in water beneficial growth performance, carcass traits, immune function, and antioxidant capacity in broiler chickens. Open Life Sci. 2021;16(1):311–22. DOI: 10.1515/biol-2021-0031

تأثير استخدام الكائنات الدقيقة الفعالة على التعبير النسجي والمناعي الكيميائي للكلى في السمان تحت الإجهاد الحراري

هديل باسم ذنون[1]، رافد خالد علي[2]، بان جاسم سعدون[3] و مروة ميسر يونس[4]

[1]فرع الأمراض وأمراض الدواجن، كلية الطب البيطري، جامعة الموصل، الموصل، [2]فرع الأمراض وأمراض الدواجن، كلية الطب البيطري، جامعة الفلوجة، [3]كلية التقنيات الطبية والصحية، جامعة الزهراء للبنات، كربلاء، [4]مديرية الزراعة، الأنبار، العراق

الخلاصة

يعتبر الإجهاد الحراري في تربية الدجاج عامل مؤثر كبير ومع زيادة درجة حرارة البيئة تزداد أهميته. لدراسة التغيرات النسجية لأنسجة الكلية بطائر السمان المعرض للإجهاد الحراري والمعامل بالكائنات الحية الدقيقة ولقياس التعبير البروتيني للانترلوكين واحد بيتا، تم استخدام أربعون طائرا بعمر يوم واحد قسمت عشوائيا الى أربعة مجاميع وبواقع عشرة طيور لكل مجموعة،، تمثلت المجموعة الأولى بالسيطرة، المجموعة الثانية عرضت للإجهاد الحراري ولمدة ستة ساعات باليوم، المجموعة الثالثة عرضت للإجهاد الحراري وعوملت بالكائنات الحية الدقيقة وبمقدار الف جزء بالمليون، المجموعة الرابعة عوملت بالكائنات الحية الدقيقة، في وسط ونهاية التجربة عند ٢٠ و ٤٠ يوماً وعلى التوالي، تم اخذ خمسة طيور من كل قتلة و وتم وزن الكلية ثم قطعت المقاطع النسجية بسمك أربعة الى خمسة ميكرون وصبغت بالصبغة الروتينية الهيماتوكسيلين والايوسين، تم تطبيق إجراءات الكيمياء المناعية لتحديد قياس التعبير البروتيني للانترلوكين واحد بيتا وفقا لبرتوكول الشركة المصنعة، حددت التغيرات النسجية المرضية بارتشاح الخلايا الالتهابية بأنواعها، النزف، ضمور الكبيبة، النخر، التحطم الشديد للظهارة، التغليظ وفرط الخلوية، بينت نتائج التحليل الإحصائي للوزن النسبي للكلية أن كان اعلى في المجموعة المعاملة بالكائنات الحية الدقيقة بالمقارنة ببقية المجاميع، اظهر التعبير البروتيني للانترلوكين واحد بيتا تعبيرا اعلى خلال فترة الأربعون يوما من التجربة بالمقارنة بالعشرين يوما الأولى، نستنتج من نتائج الدراسة الحالية بانه على الرغم من كون طائر السمان مقاوم للظروف البيئة إلا أن الإجهاد الحراري كان له تأثير سلبي على معاير الدراسة.